CLAIMS

1. A method for obtaining a magnetic field correlation ("MFC") of a sample using magnetic resonance imaging ("MRI") comprising:

applying two or more spin echo sequences to the sample to obtain a resultant information, wherein at least one spin echo sequence is an asymmetric spin echo sequence; and

determining the MFC as a function of the resultant information.

2. The method of claim 1, wherein the spin echo sequences include an Asymmetric Dual Spin Echo Sequence (ADSE) having multiple echoes.

3. The method of claim 1, wherein the spin echo sequences include an Echo Planar Imaging-Asymmetric Dual Spin Echo Sequence (EPI-ADSE) having multiple echoes.

4. The method of claim 1, wherein the asymmetric spin echo sequence is applied by shifting a refocusing pulse that is applied to the sample wherein a first time (t_1) between a rotation pulse that is applied to the sample and the refocusing pulse is not equal to a second time (t_2) between the refocusing pulse and obtaining the resultant information.

5. The method of claim 1, wherein the asymmetric spin echo sequence is applied by shifting obtaining of the resultant information wherein a first time (t_1) between a rotation pulse that is applied to the sample and the refocusing pulse is not equal to a second time (t_2) between the refocusing pulse and obtaining the resultant information.

6. The method of claim 1, wherein the MFC is determined as a function of the resultant information by applying the formula

$$K[(2n-1)\Delta t] \approx \frac{(-1)^{n+1}}{2\gamma^2 t_s^2} \ln\left[\frac{S_n(0)S_{n-1}(t_s)}{S_n(t_s)S_{n-1}(0)}\right],$$

wherein γ is the proton gyromagnetic ratio, S_n is the signal intensity of the nth echo; $t_s = |t_1 - t_2|$, where t_1 is the time between a rotation pulse that is applied to the sample and a refocusing pulse that is applied to the sample and t_2 is the time between the refocusing pulse and obtaining the resultant information.

7. The method of claim 1, further comprising generating an image as a function of the determined MFC.

8. The method of claim 1, further comprising determining a distribution of a paramagnetic element in the sample as a function of the determined MFC.

9. The method of claim 1, further comprising determining a distribution of iron in the sample as a function of the determined MFC.

10. The method of claim 1, further comprising adding a contrast agent to the sample prior to applying the spin echo sequences.

11. The method of claim 10, wherein the contrast agent is gadopentetate dimeglumine ("Gd-DTPA").

12. The method of claim 1, further comprising classifying a tumor in the sample.

13. A system for obtaining a magnetic field correlation ("MFC") of a sample using magnetic resonance imaging ("MRI") comprising:

a storage medium, wherein the storage medium includes software that is capable of being executed to perform steps comprising:

applying two or more spin echo sequences to the sample to obtain a resultant information, wherein at least one spin echo sequence is an asymmetric spin echo sequence; and

determining the MFC as a function of the resultant information.

14. The system of claim 13, wherein the spin echo sequences include an Asymmetric Dual Spin Echo Sequence (ADSE) having multiple echoes.

15. The system of claim 13, wherein the spin echo sequences include an Echo Planar Imaging-Asymmetric Dual Spin Echo Sequence (EPI-ADSE) having multiple echoes.

16. The system of claim 13, wherein the asymmetric spin echo sequence is applied by shifting a refocusing pulse that is applied to the sample wherein a first time (t_1) between a rotation pulse that is applied to the sample and the refocusing pulse is not equal to a second time (t_2) between the refocusing pulse and obtaining the resultant information.

17. The system of claim 13, wherein the asymmetric spin echo sequence is applied by shifting obtaining of the resultant information wherein a first time (t_1) between a rotation pulse that is applied to the sample and the refocusing pulse is not equal to a second time (t_2) between the refocusing pulse and obtaining the resultant information.

18. The system of claim 13, wherein the MFC is determined as a function of the resultant information by applying the formula

$$K[(2n-1)\Delta t] \approx \frac{(-1)^{n+1}}{2\gamma^2 t_s^2} \ln\left[\frac{S_n(0)S_{n-1}(t_s)}{S_n(t_s)S_{n-1}(0)}\right],$$

wherein γ is the proton gyromagnetic ratio, S_n is the signal intensity of the nth echo; $t_s = |t_1 - t_2|$, where t_1 is the time between a rotation pulse that is applied to the sample and a refocusing pulse that is applied to the sample and t_2 is the time between the refocusing pulse and obtaining the resultant information.

19. The system of claim 13, further comprising generating an image as a function of the determined MFC.

20. The system of claim 13, further comprising determining a distribution of a paramagnetic element in the sample as a function of the determined MFC.

21. The system of claim 13, further comprising determining a distribution of iron in the sample as a function of the determined MFC.

22. The system of claim 13, further comprising adding a contrast agent to the sample prior to applying the spin echo sequences.

23. The system of claim 22, wherein the contrast agent is gadopentetate dimeglumine ("Gd-DTPA").

24. The system of claim 13, further comprising classifying a tumor in the sample.

25. A software arrangement which, when executed on a processing device, configures the processing device to measure a magnetic field correlation ("MFC") of a sample using magnetic resonance imaging ("MRI") comprising a set of instructions which when executed by the processing device perform steps comprising:

applying two or more spin echo sequences to the sample to obtain a resultant information, wherein at least one spin echo sequence is an asymmetric spin echo sequence; and

determining the MFC as a function of the resultant information.

26. The software arrangement of claim 25, wherein the spin echo sequences include an Asymmetric Dual Spin Echo Sequence (ADSE) having multiple echoes.

27. The software arrangement of claim 25, wherein the spin echo sequences include an Echo Planar Imaging-Asymmetric Dual Spin Echo Sequence (EPI-ADSE) having multiple echoes.

28. The software arrangement of claim 25, wherein the asymmetric spin echo sequence is applied by shifting a refocusing pulse that is applied to the sample wherein a first time (t_1) between a rotation pulse that is applied to the sample and the refocusing pulse is not equal to a second time (t_2) between the refocusing pulse and obtaining the resultant information.

29. The software arrangement of claim 25, wherein the asymmetric spin echo sequence is applied by shifting obtaining of the resultant information wherein a first time (t_1) between a rotation pulse that is applied to the sample and the refocusing pulse is not equal to a second time (t_2) between the refocusing pulse and obtaining the resultant information.

30. The software arrangement of claim 25, wherein the MFC is determined as a function of the resultant information by applying the formula

$$K[(2n-1)\Delta t] \approx \frac{(-1)^{n+1}}{2\gamma^2 t_s^2} \ln\left[\frac{S_n(0)S_{n-1}(t_s)}{S_n(t_s)S_{n-1}(0)}\right],$$

wherein γ is the proton gyromagnetic ratio, S_n is the signal intensity of the nth echo; $t_s = |t_1 - t_2|$, where t_1 is the time between a rotation pulse that is applied to the sample and a refocusing pulse that is applied to the sample and t_2 is the time between the refocusing pulse and obtaining the resultant information.

31. The software arrangement of claim 25, further comprising generating an image as a function of the determined MFC.

32. The software arrangement of claim 25, further comprising determining a distribution of a paramagnetic element in the sample as a function of the determined MFC.

33. The software arrangement of claim 25, further comprising determining a distribution of iron in the sample as a function of the determined MFC.

34. The software arrangement of claim 25, further comprising adding a contrast agent to the sample prior to applying the spin echo sequences.

35. The software arrangement of claim 25, wherein the contrast agent is gadopentetate dimeglumine ("Gd-DTPA").

36. The software arrangement of claim 25, further comprising classifying a tumor in the sample.